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PEOPLE'S REPUBLIC OF CHINA**

GB/T 41572-2022

**Measurement methods for the main parameters of pulsed
lasers in the time domain**

脉冲激光时域主要参数测量方法

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part

1. Structure and Drafting Rules of Standardization Documents" drafted. Please note that some content of this document may be patented. The issuing agency of this document assumes no responsibility for identifying patents. This document is proposed by China Machinery Industry Federation. This document is under the jurisdiction of the National Optical Radiation Safety and Laser Equipment Standardization Technical Committee (SAC/TC284). This document is drafted by: Institute of Aerospace Information Innovation, Chinese Academy of Sciences, Chinese Academy of Metrology, Peking University, Chinese Academy of Sciences Institute of Science, Wuhan Huagong Laser Engineering Co., Ltd., Huagong Farley Lecce Welding System Engineering Co., Ltd., Suzhou Pavo Laser Technology Co., Ltd. Co., Ltd., Zhongshan Indium Laser Technology Co., Ltd., Wuhan Raycus Fiber Laser Technology Co., Ltd., Shandong Huaguang Optoelectronics Co., Ltd. Company, Han's Laser Technology Industry Co., Ltd., Shenzhen Dingxin Technology Co., Ltd. The main drafters of this document. Ma Yunfeng, Fan Zhongwei, Wu Aiping, Deng Yuqiang, Zhang Zhigang, Zhao Peng, Cheng Wang, Wang Zhaohua, Li Ting, Zhou Xiaozhuang, Guo Guangyan, Bai Fang, Wang Xianzhi, Sun Qing, Shi Chaohui, Li Ying, Yan Dapeng, Xiao Chengfeng, Zeng Lixia, Gao Fengxiang. Measurement method of main parameters of pulsed laser in time domain

1 Scope

China's national methods for measuring the main time-domain parameters of pulsed lasers. A pulsed laser is characterised by quantities that a continuous one does not have, and each of them requires its own measurement: the pulse energy, the pulse duration, the repetition rate, the peak power that follows from the first two, and the pulse shape and jitter. The difficulty scales with how short the pulse is. Nanosecond pulses are measured directly with a fast photodiode and an oscilloscope; picosecond pulses are at the limit of what electronics can resolve; and femtosecond pulses cannot be measured electronically at all, because no detector responds that fast - they are measured by using the pulse to measure

itself, through autocorrelation or the more elaborate techniques that recover the phase as well. Since peak power is what determines what the laser does to a material, and it depends inversely on the duration, getting this right is not academic.

JJF1493-2014 Ultrashort optical pulse autocorrelator calibration specification

2 Normative references

The contents of the following documents constitute essential provisions of this document through normative references in the text. Among them, dated citations documents, only the version corresponding to that date applies to this document; for undated references, the latest edition (including all amendments) applies to this document.

GB 7247.1 Safety of Laser Products Part

GB/T 15313 Laser Terminology

GB/T 15490 General Specification for Solid State Lasers JB/T 12632 Fiber Laser

ISO 11145.2018 Optical and photonics lasers and laser equipment vocabulary and symbols (Opticsandphotonics-Lasers

ISO 15367-1.2003 Lasers and laser-related equipment-Test methods for the determination of the wavefront shape of laser beams-Part

3 Terms and Definitions

GB/T 15313, JJF1493-2014, ISO 11145.2018 and ISO 15367-1.2003 and the following terms and definitions applies to this document.

3.1 pulsed laser pulsedlaser Laser light radiated in the form of a single pulse or a sequence of pulses with a pulse duration of less than 0.25s. [Source: ISO 11145.2018, 3.19.3]

3.2 rising edge of the pulse Pulse laser duration waveform rising curve.

3.3 falling edge of the pulse Pulse laser duration waveform drop curve.